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/SUMMARY/

DEVELOPMENT OF INFRARED RADIATION RECEIVERS

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The first apparatus to operate on the principle of the conversion of radiation energy into thermal energy was the bolometer, developed by Langley. With this bolometer langley was able to carry out a whole series of invostigations on energy distribution in the solar spectrum up to the 20 M wave length.

Pringsheim used the radiometric effect described by Kurak to study infrared rays. However the radiometer did not receive a very wide application because of its complex construction.

The thermocarple) developed by Hobil and Molon was valuable not only to physics but also to many other natural sciences. However, the electromotive force produced by such apparatus was small.

A device was later developed which concentrated the rays in the region of the joint of the thermocouple. It was determined that relatively good results were obtainable by use of a series of thermocuples, thus giring rise to what is known as the "thermopole." P. Lebedev, famous Russian physicist, showed that the sensitivity of this thermopole can be greatly increased if it is encased in a vessel from which the air has been evacuated. The problem of inertia -- time required for heating and oboling the indicator of a thermopole -- is a very important one. Technicians are now attriving to minimize this inertia as much as possible. Today the thermopole has been improved so that it is very sensitive to even the smallest temperature variations. In spite of its great sensitivity, its great inertia and low resistance limit its application in industry.

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The sensitivity of the bolometer was increased by the use of a thin nickel film on nitrocellulose leaves. It was thus possible to determine changes of the order of several millionths of a watt. More recently, non-metallic substances have been used as resistances because it was found that they showed greater changes of resistance due to heating than did the pure metal. This resulted in development of "thermistors." Nevertheless, in spite of many improvements made in construction of bolometers, their high inertia limits their use.

The application of Stoletov's photoeffect phenomenon has received wide application in high-speed indicators, television equipment, sound movies, and many other fields. But the very nature of the photoelement limits its field of use by requiring different types of photoelements for different wave bands. It has been suggested that the reason for lack of response by the apparatus in some regions of the infrared band is that the quantum of rediation energy is too small to release the electron from the photoelement in the vacuum. The most recent work has resulted in the manufacture of an apparatus which contains a photoelementwith a cesium photolayer. This cesium-photoelement. Its sensitivity limits are 1.2 to 1.4 M and its maximum sensitivity is in the vicinity of 0.8 M.

It appears that subsequent research on photoelements should exploit the so-called internal photoeffect. This phenomenon is based on the theory that the conductance of some substances is increased when they are subjected to light. Such substances usually have a small number of conducting electrons, and are more popularly known as semiconductors.

Academician A. F. loffe is presently doing much work with semiconductors, and every day brings him and his school closer to solving the problem of semiconductors. It has been determined that the energy required to release an electron inside a substance as a result of absorption of radiation energy is less than the energy required to release an electron in a vacuum.

Orygen acts very favorably on semiconductors, and there is a whole series of these substances which will become active only after being acted on by oxygen. The theoretical bases of this phenomenon were determined only very recently.

Today, scientists are interested in discovering more about the action of Photorosistant materials manufactured from thallium gulfide (TIS) and lead sulfide (FBS). TIS, also known as "thallofide," is sensitive to light waves of 1.4 μ , while PtS is sensitive up to 3.6 μ .

In conclusion, it must be mentioned that the efficiency of photoelements encased in a vacuum as well as photoelements manufactured from semiconductors is very low and at best is only some hundredths of a pircent. But because of the confirments of contexturary science, and the excellent equipment for amplifying teak currents, infrared receivers occupy an important place in contemporary technology. It is only in those instances where it is necessary to register long-wave radiation that thermal receivers are used instead of photoelement receivers.

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